

US Geological Survey Coal Sampling Data

**US Geological Survey Coal Sampling Data
from
US Geological Survey Professional Paper 1625-A**

Additional Data Available At:

<http://greenwood.cr.usgs.gov/energy/coal/PP1625A/Chapters/WQ.pdf>



Table WQ-1. Summary data for the hagel, Beulah-Zap, Harmon, and Hansen coal zones assessed in the Williston Basin, North Dakota. Calculated from the unpublished U.S. Geological Survey coal quality database (USCHEM), February, 1992; Bragg and others (1994); and proprietary source(s)

Variable	Number of samples	Range		Mean
		Minimum	Maximum	
Moisture ¹	281	27.70	51.24	37.88
Ash ¹	281	4.00	31.00	7.96
Total sulfur ¹	281	0.30	3.50	0.84
Calorific value ²	281	3,260	7,860	6,510
lb SO ₂ ³	281	0.79	12.14	2.54
MMMF BTU ⁴	281	5,110	8,560	7,110
Antimony ⁵	52	0.075L	3.0	0.60
Arsenic ⁵	53	1.8	32	9.1
Beryllium ⁵	38	0.21L	2.2	0.73
Cadmium ⁵	53	0.011L	0.95	0.086
Chromium ⁵	53	0.76	54	7.4
Cobalt ⁵	49	0.31L	43	2.9
Lead ⁵	53	0.70L	12	3.5
Manganese ⁵	53	8.7	580	75
Mercury ⁵	53	0.02	0.5	0.14
Nickel ⁵	51	0.80L	57	4.3
Selenium ⁵	52	0.050L	1.6	0.74
Uranium ⁵	53	0.31	4.3	1.5

¹ Values are in percent and on an as-received basis.

² Value is in British thermal units per pound of coal (Btu).

³ Value is in pounds per million Btu and on an as-received basis.

⁴ Value is in British thermal units on a moist, mineral-matter-free basis.

⁵ Values are in parts per million (ppm) on a whole-coal and remnant-moisture basis; "L" denotes less than value shown.



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Table WQ-2. Summary data for the Hagel coal zone, Center-Falkirk coalfield, Williston Basin, North Dakota. Calculated from the unpublished U.S. Geological Survey coal quality database (USCSEM), February, 1992; Bragg and others (1994); and proprietary source(s)

Variable	Number of samples	Range		Mean
		Minimum	Maximum	
Moisture ¹	128	30.80	51.24	38.82
Ash ¹	128	4.00	17.47	8.09
Total sulfur ¹	128	0.30	1.78	0.77
Calorific value ²	128	4,890	7,530	6,420
lb SO ₂ ³	128	0.83	5.44	2.43
MMMF BTU ⁴	128	5,360	7,900	7,020
Antimony ⁵	6	0.10	1.10	0.54
Arsenic ⁵	6	5.0	28	13
Beryllium ⁵	4	0.36	1.1	0.73
Cadmium ⁵	6	0.036L	0.16	0.083
Chromium ⁵	6	0.76	8.5	4.9
Cobalt ⁵	5	0.31L	2.1	0.90
Lead ⁵	6	0.90	8.2	3.3
Manganese ⁵	6	11	46	20
Mercury ⁵	6	0.050L	0.5	0.18
Nickel ⁵	6	0.97	6.2	2.8
Selenium ⁵	5	0.80	1.6	1.1
Uranium ⁵	6	0.47	3.2	1.5

¹ Values are in percent and on an as-received basis.

² Value is in British thermal units per pound of coal (Btu).

³ Value is in pounds per million Btu and on an as-received basis.

⁴ Value is in British thermal units on a moist, mineral-matter-free basis.

⁵ Values are in parts per million (ppm) on a whole-coal and remnant-moisture basis; "L" denotes less than value shown.



Table WQ-3. Summary data for the Beulah-Zap coal zone, Beulah coalfield, Williston Basin, North Dakota. Calculated from the unpublished U.S. Geological Survey coal quality database (USCSEM), February, 1992; Bragg and others (1994); and proprietary source(s)

Variable	Number of samples	Range		Mean
		Minimum	Maximum	
Moisture ¹	112	27.7	47.53	36.97
Ash ¹	112	4.34	30.70	7.33
Total sulfur ¹	112	0.30	2.80	0.78
Calorific value ²	112	4,490	7,860	6,710
lb SO ₂ ³	112	0.79	8.15	2.33
MMMFBTu ⁴	112	5,110	8,560	7,280
Antimony ⁵	31	0.075L	1.9	0.45
Arsenic ⁵	32	1.8	30	8.3
Beryllium ⁵	25	0.22	2.24	0.66
Cadmium ⁵	32	0.011L	0.19	0.064
Chromium ⁵	32	1.2	54	8.5
Cobalt ⁵	31	0.45	43	3.5
Lead ⁵	32	1.2	11	3.6
Manganese ⁵	32	14	580	74
Mercury ⁵	32	0.03	0.21	0.096
Nickel ⁵	32	0.80L	57	4.4
Selenium ⁵	32	0.39	1.3	0.69
Uranium ⁵	32	0.38	4.0	1.1

¹ Values are in percent and on an as-received basis.

² Value is in British thermal units per pound of coal (Btu).

³ Value is in pounds per million Btu and on an as-received basis.

⁴ Value is in British thermal units on a moist, mineral-matter-free basis.

⁵ Values are in parts per million (ppm) on a whole-coal and remnant-moisture basis; "L" denotes less than value shown.



Table WQ-4. Summary data for the Harmon coal zone, Bowman-Dickinson coalfield, Williston Basin, North Dakota. Calculated from the unpublished U.S. Geological Survey coal quality database (USCHEM), February, 1992; Bragg and others (1994); and proprietary source(s)

Variable	Number of samples	Range		Mean
		Minimum	Maximum	
Moisture ¹	32	29.50	46.20	39.02
Ash ¹	32	4.40	19.10	8.16
Total sulfur ¹	32	0.30	2.40	1.00
Calorific value ²	32	5,060	7,620	6,200
lb SO ₂ ³	32	0.96	8.21	3.29
MMMFbtu ⁴	32	5,670	8,020	6,790
Antimony ⁵	14	0.20	3.0	0.70
Arsenic ⁵	14	2.0	32	8.27
Beryllium ⁵	9	0.21L	0.87	0.41
Cadmium ⁵	14	0.029	0.21	0.072
Chromium ⁵	14	0.83	13	3.70
Cobalt ⁵	13	0.40	2.6	1.1
Lead ⁵	14	0.70L	12	3.5
Manganese ⁵	14	8.7	200	90
Mercury ⁵	14	0.02	0.48	0.19
Nickel ⁵	13	1.1	7.7	2.5
Selenium ⁵	14	0.050L	1.6	0.73
Uranium ⁵	14	0.31	4.3	1.2

¹ Values are in percent and on an as-received basis.

² Value is in British thermal units per pound of coal (Btu).

³ Value is in pounds per million Btu and on an as-received basis.

⁴ Value is in British thermal units on a moist, mineral-matter-free basis.

⁵ Values are in parts per million (ppm) on a whole-coal and remnant-moisture basis; "L" denotes less than value shown.



Table WQ-5. Summary data for the Hansen coal zone, Bowman-Dickinson coalfield, Williston Basin, North Dakota. Calculated from the unpublished U.S. Geological Survey coal quality database (USCHEM), February, 1992; Bragg and others (1994); and proprietary source(s)

Variable	Number of samples	Range		Mean
		Minimum	Maximum	
Moisture ¹	9	31.80	41.20	35.99
Ash ¹	9	7.10	31.00	11.45
Total sulfur ¹	9	0.60	3.50	1.45
Calorific value ²	9	3,260	7,710	6,440
lb SO ₂ ³	9	1.94	12.14	4.80
MMMBtu ⁴	9	5,860	8,400	7,360
Antimony ⁵	1	0.50	0.50	0.50
Arsenic ⁵	1	5.0	5.0	5.0
Beryllium ⁵	0	—	—	—
Cadmium ⁵	1	0.055	0.055	0.055
Chromium ⁵	1	1.7	1.7	1.7
Cobalt ⁵	0	—	—	—
Lead ⁵	1	5.1	5.1	5.1
Manganese ⁵	1	57	57	57
Mercury ⁵	1	0.48	0.48	0.48
Nickel ⁵	0	—	—	—
Selenium ⁵	1	1.2	1.2	1.2
Uranium ⁵	1	1.6	1.6	1.6

¹ Values are in percent and on an as-received basis.

² Value is in British thermal units per pound of coal (Btu).

³ Value is in pounds per million Btu and on an as-received basis.

⁴ Value is in British thermal units on a moist, mineral-matter-free basis.

⁵ Values are in parts per million (ppm) on a whole-coal and remnant-moisture basis; "L" denotes less than value shown.

**US Geological Survey (USGS) Coal Sampling Data
from**

**Chapter 5 of the USGS Report Entitled “The Origin and Distribution of HAPs Elements in
Relation to Maceral Composition of the A1 Lignite Bed (Paleocene, Calvert Bluff
Formation, Wilcox Group), Calvert Mine Area, East-Central Texas”**

Additional Data Available At:

[http://pubs.usgs.gov/of/1995.of95-595/CHPT5.htm](http://pubs.usgs.gov/of/1995/of95-595/CHPT5.htm)



Coal Geology of the Paleocene-Eocene Calvert Bluff Formation (Wilcox Group) and the Eocene Manning Formation (Jackson Group) in east-central Texas

Edited by P.D. Warwick and S.S. Crowley

U.S. Geological Survey Open-File Report 95-595

Proximate Analyses (Dry basis, except where noted otherwise)

ID	Depth (cm)	Thick (cm)	Calorific Value (BTU/LB)	Ash Yield (%)	Mois. (AsRec.) (%)	Total Sulfate Sulfur (%)	Pyritic Sulfur (%)	Organic Sulfur (%)
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A1.1.1	0	39	8512	32.6	29.4	0.8	0.03	0.07	0.7
A1.1.2	39	45	10667	16.9	33.8	1.3	0.02	0.27	1
A1.1.3	84	58	11373	12	33	3.2	0.04	2.09	1.1
A1.1.4	142	50	11792	8.9	33.1	1	0.01	0.02	0.9
A1.P1	192	16	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
A1.P2	208	16	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
A1.2.1	224	45	11578	11.4	32.3	1	0.01	0.02	0.9
A1.2.2	269	27	11387	10.7	36.7	1.4	0.01	0.13	1.2
A1.2.3	296	20	10632	16.5	35.2	1.2	0.01	0.05	1.1

Major Oxides (Whole coal basis; in percent)

ID	Ash	SiO ₂	Fe ₂ O ₃	MgO	CaO	Na ₂ O	TiO ₂	P ₂ O ₅	K ₂ O	SO ₃	Al ₂ O ₂
	(air-dried basis)										

A1.1.1	30	22.5	0.6	0.3	1.3	0.07	0.3	0.012	0.45	1.8	3.6
A1.1.2	15.8	8.1	0.6	0.3	1.5	0.07	0.3	0.005	0.1	2.4	2.4
A1.1.3	11.2	2.6	2.6	0.2	1.6	0.06	0.1	0.002 L	0.03	2.8	1.1
A1.1.4	8.4	2	0.3	0.2	1.5	0.07	0.1	0.003	0.01	2.1	1.4
A1.P1	29.2	13.4	0.9	0.4	1.6	0.14	0.6	0.02	0.26	2.1	8.2
A1.P2	40.6	20.7	1.3	0.5	1.4	0.19	0.5	0.024	0.41	1.8	11.8
A1.2.1	10.8	4.1	0.3	0.3	1.7	0.07	0.2	0.004	0.02	2.2	1.7
A1.2.2	10	3.3	0.5	0.2	1.5	0.06	0.2	0.006	0.02	2.5	1.4
A1.2.3	15.2	7.6	0.4	0.3	1.5	0.06	0.2	0.011	0.1	2.3	2.7

Trace Elements (Whole coal basis; in ppm)

ID	Ag	As	Au	B	Ba	Be	Bi	Cd	Ce	Co	Cr
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A1.1.1	0.6	3	3	204	189	2.4	0.6	0.24	33	7.2	17
A1.1.2	0.5	0.6	1.6	190	136	1.3	0.3	0.13	16	3	13
A1.1.3	0.2	1.1	1.1	167	109	0.3	0.2	0.09	10	1.9	8
A1.1.4	0.3	0.3	0.8	210	101	0.3	0.2	0.07	12	2	8
A1.P1	0.6	2	2.9	199	237	0.6	0.9	0.29	38	2.3	47
A1.P2	0.8	8.1	4.1	227	166	0.8	0.8	0.81	73	6.1	45
A1.2.1	0.4	0.4	1.1	216	151	1.1	0.2	0.11	24	5	15
A1.2.2	0.5	1	1	220	160	2.3	0.2	0.1	24	5.6	11
A1.2.3	0.7	0.9	1.5	229	152	3.8	0.3	0.12	44	10.7	15
ID	Cs	Cu	Dy	Er	Eu	Ga	Gd	Ge	Hf	Hg	Ho
A1.1.1	1.2	16	2.7	1.8	0.6	11.7	2.4	25.8	3	0.03	0.6
A1.1.2	0.32	24	1.7	1	0.3	6.2	1.6	1	1.6	0.1	0.32
A1.1.3	0.05	13	0.8	0.4	0.2	2.5	0.9	0.4	0.9	0.48	0.11
A1.1.4	0.04	22	1	0.5	0.3	3.7	0.8	0.4	0.6	0.12	0.17
A1.P1	2.39	85	2.6	1.5	0.6	16.9	2.6	1.3	2.9	0.31	0.58
A1.P2	4.06	85	3.2	1.6	1.2	18.7	4.1	4.1	2.8	0.16	0.41
A1.2.1	0.04	27	2.5	1.3	0.6	4.1	2.2	0.5	1.1	0.08	0.43
A1.2.2	0.08	30	2.6	1.6	0.6	6.9	2	2.9	1	0.11	0.5
A1.2.3	0.66	24	4.6	2.9	1.1	12.3	4.6	4.4	1.5	0.04	0.91
ID	La	Li	Mn	Mo	Nb	Nd	Ni	Pb	Pr	Rb	Sb
A1.1.1	18	12	90	2.5	6	15	7	9	3.6	19.7	2
A1.1.2	10	6	127	2.1	4.8	6	4	8	1.7	4.1	0.8
A1.1.3	6	4	145	1.8	1.1	4	4	2	1.1	0.5	0.3
A1.1.4	7	6	202	1.3	1.7	5	6	3	1.3	0.5	0.7
A1.P1	23	22	169	5.5	15.8	15	7	28	3.8	20.4	2.5
A1.P2	45	53	130	7.3	16.2	28	13	37	7.7	33.3	3.3
A1.2.1	11	11	184	2.3	2.2	12	8	3	2.8	0.3	0.8
A1.2.2	12	7	130	3.8	3	11	8	6	2.7	0.8	1.7
A1.2.3	21	8	123	3.7	4.6	21	11	7	5	5.5	3.2
ID	Sc	Se	Sm	Sn	Sr	Ta	Tb	Te	Th	Tl	Tm
A1.1.1	6	5	2.7	3.0L	123	0.6	0.3	0.6L	5.1	0.6L	0.3
A1.1.2	4.3	11	1.4	1.6L	143	0.5	0.3	0.3L	4.8	0.3L	0.1
A1.1.3	2.5	9	0.9	1.1L	134	0.1	0.1	0.2L	1.8	0.2L	0.1
A1.1.4	2.6	11	1.1	0.8L	168	0.2	0.2	0.2L	1.6	0.2L	0.1
A1.P1	9.1	12	2.6	2.9	190	0.9	0.3	0.6	12.8	0.6	0.2
A1.P2	10.6	145	5.3	4.1	175	0.8	0.4	0.8	14.6	0.8	0.2
A1.2.1	4.6	9	2.5	1.1L	205	0.2	0.3	0.2L	2.9	0.2L	0.2
A1.2.2	3.6	9	2.2	1	190	0.3	0.4	0.2L	4.2	0.2L	0.2
A1.2.3	8.7	8	4.1	1.5L	183	0.5	0.6	0.3L	4.6	0.3L	0.5

ID	U	V	W	Y	Yb	Zn	Zr
A1.1.1	2.6	44	1.5	12	1.8	27.9	111
A1.1.2	2.5	41	1	8.1	1	3.6	52
A1.1.3	0.9	15	0.6	3.3	0.4	1	25
A1.1.4	1.1	17	0.8	5	0.4	1.6	15
A1.P1	6.4	123	1.8	10.2	1.5	4.1	85
A1.P2	10.2	142	2	11.8	1.6	16.2	81
A1.2.1	1.6	28	0.9	13	1.1	1	33
A1.2.2	2.5	37	1	16	1.3	6.4	33
A1.2.3	4.1	44	1.1	25.9	2.6	2.3	41

Table 1. Chemical analyses for the lignite and shaley coal samples taken from the A1 bed, Calvert mine. Data includes proximate, forms of sulfur, major oxide, and trace element analyses. All data is on a whole-coal basis. L = less than, n.d. = no data.

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